Application No. 09/735,762
Filed: December 13, 2000
Group Art Unit: 1746
Confirmation No.: 6659

REMARKS

Claims 12-23 are pending in the present application. Claims 12-15 and 18-21 are currently amended, claims 16-17 are canceled, and claims 22-23 remain as previously presented.

Information Disclosure Statement

In Applicant's IDS dated April 27, 2001, five German references were cited to the Office. In the Office Action dated June 4, 2003, the Examiner refused to consider these references on the grounds that a concise explanation of the relevance of the same had not been provided. In Applicant's response dated Sept. 4, 2003, Applicant provided such concise explanations.

In order to ensure that the record reflects that these references have indeed been considered, Applicant submits herewith an IDS listing the five previously submitted German references along with the characterizations thereof submitted in the Sept. 4, 2003 response. Applicant respectfully requests that these references be considered and an indication of such consideration be made of record.

Claim Rejections - 35 U.S.C. §102

Claims 12-23 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Pat. No. 5,904,737 to Preston et al. ("Preston").

Applicant has made a number of amendments to the claims for the purpose of clarifying the scope of the protection sought thereby. Specifically, in claim 12, the claimed method recites a sequence of establishing and de-establishing fluid flow paths, either gas or liquid, for carrying out a dry-cleaning sequence.

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To summarize, pressure equalization between a first storage vessel containing dry-cleaning medium and the cleaning vessel is performed by establishing a gas flow path therebetween. Next, liquid dry-cleaning medium is transferred from a second storage vessel to the cleaning vessel, with displaced gas being returned to the second storage vessel. Agitation of substrates in the cleaning vessel ensues.

Following agitation, liquid dry-cleaning medium is transferred to the second storage vessel as gaseous dry-cleaning medium flows back into the cleaning vessel. Remaining gaseous dry-cleaning medium in the cleaning vessel is then returned to the first storage vessel.

A major benefit of the disclosed method is that the temperature of the dry-cleaning medium in the first storage vessel is allowed to decrease substantially as the pressure in the first storage vessel is equalized with that of the cleaning vessel. If the liquid dry-cleaning medium in the first storage vessel were to be used for substrate agitation in the cleaning vessel, it would have to be heated in order to avoid damaging the substrates, or it would have to be maintained at extremely high pressure in the first storage vessel prior to pressure equalization so as to offset the temperature reduction caused by decreased pressure, or both.

In the claimed method, once the cleaning vessel pressure has been raised to a point equal to that of the first storage vessel, the introduction of liquid dry-cleaning medium into the cleaning vessel from the second storage vessel results in minimal evaporation and thus minimized temperature decrease of the liquid dry-cleaning medium introduced into the cleaning vessel. The need

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for heating means for liquid dry-cleaning medium from the second storage vessel is thus minimized or eliminated altogether, resulting in significant cost savings.

In contrast, the method of Preston includes performing only partial pressure equalization between a first storage tank (tank 20 in the illustrated embodiment) and the cleaning chamber 32. The first and second storage tanks are previously pressurized to approximately 650 to 690 psi (Preston, col. 4, l. 13). "[T]he head space of one of the storage tanks (tank 20 in FIG. 1C) is connected to the chamber so that the latter is pressurized with carbon dioxide gas to an intermediate pressure of about 70 psi." (Preston, col. 4, ll. 50-53). "As shown in FIG. 1D, high pressure liquid carbon dioxide is then fed through line 50 via the pressure differential between storage tank 20 and cleaning chamber 32." (Preston, col. 4, ll. 58-60. Thus, contrary to the Examiner's assertion, both pressure equalization and liquid dry-cleaning medium are performed with the same storage tank in Preston.

"[C]hamber 32 and storage tank 20 (and storage tank 18) are approximately the same size.... At this point, the liquid carbon dioxide within filled chamber 32 is at a pressure and temperature of about 650 psi and 54°F, respectively." (Preston, col. 4, l. 62 - col. 5, l. 5). There is no indication of the temperature of the contents of the storage tanks 18, 20 prior to the initial transfer to the cleaning chamber 32 in Preston, though it is clear that the pressure is approximately 650 - 690 psi and that the storage tanks 18, 20 and the cleaning chamber 32 all have approximately the same volume. One must conclude, then, that for the pressure in storage tank 20 to remain at 650 psi and for the cleaning chamber 32 to be brought from atmospheric pressure to 650 psi at 54°F, the

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temperature of the storage tanks must be well above 54°F prior to pressure equalization. This is confirmed by the need for a refrigeration circuit 64 in the liquid feed line from the storage tanks 18, 20. Consequently, the system of Preston must include storage tanks capable of maintaining pressures as high as 800 psi (Preston, col. 5, l. 36) at temperatures well above 54°F (see reasoning above), and a refrigeration circuit for reducing the temperature of liquid carbon dioxide to appropriate levels.

Subsequently, to impart agitation within the cleaning chamber, Preston provides liquid carbon dioxide from one tank (tank 18 in Fig. 1F) and returns gaseous carbon dioxide to the other tank (tank 20 in Fig. 1F). The flow of liquid and gaseous carbon dioxide is then reversed, as described with respect to Fig. 1G. This agitation process is also distinct from the steps recited in the claimed method.

The deficiencies associated with Preston, as described above, are overcome by the presently claimed method, since the temperature of dry-cleaning medium in the first storage vessel is allowed to drop significantly as pressure is equalized by it and the cleaning vessel. This brings the internal pressure of the cleaning vessel to a value relatively close to that of the second storage vessel, such that minimal temperature adjustment is necessary. This also obviates the need for storage tanks which are capable of withstanding high pressures and high temperatures.

Claim 12 of the present application further recites, following agitation, the step of establishing a second liquid flow path and a third gas flow path between the cleaning vessel and the second storage vessel. This results in liquid dry-cleaning medium transfer from the cleaning vessel to the second storage vessel.

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Then, a gas flow path is established between the cleaning vessel and the first storage vessel to evacuate gaseous dry-cleaning medium from the cleaning vessel. A compressor is utilized in the latter step, and results in a temperature increase in the first storage vessel only. (Dependent claims 18 and 19 acknowledge that the heat in this compressed gas can be used for other purposes.)

Preston thus utilizes, in one embodiment, two storage tanks in selective communication with a cleaning chamber with selective use of a compressor, but does not utilize them according to the presently claimed method, thus resulting in a system which is relatively more expensive to assemble and operate.

Dependent claims 13-23 are believed to be allowable at least on the grounds of being dependent from an allowable base claim.

Claim 13 has been amended to recite that establishment of the first gas flow path and the first and second fluid flow paths involve selective operation of valves associated with conduits interconnecting the vessels.

Likewise, claim 14 has been amended to recite that establishment of the second, third, and fourth gas flow paths involve selective operation of a compressor and valves associated with conduits interconnecting the vessels.

Claim 15 has been amended to recite the additional step of using a compressor to pressurize the cleaning vessel with gas from the first storage vessel.

Claim 18 has been amended to clarify the step of using latent heat in the fourth gas flow path for heating the cleaning vessel and its contents.

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Claim 19 has been amended to clarify the step of using latent heat in the fourth gas flow path for heating the first storage vessel and its contents.

Claims 20 and 21 have been amended for clarity purposes.

Claims 22 and 23 are not presently amended.

Claim Rejections - 35 U.S.C. §103(a)

Claims 18 and 21 are rejected under 35 U.S.C. §103(a) as being obvious over Preston in view of U.S. Pat. No. 5,850,747 to Roberts et al. ("Roberts").

Claim 18 is considered allowable as being dependent on an allowable base claim, per the argument raised above. Additionally, claim 18 recites the steps of establishing the fourth gas flow path through a heat exchanging conduit disposed within the cleaning vessel. Roberts discloses the provision of a compressor 60 integral with a chamber 13 from evacuating gas therefrom.

It is apparent that every time gas is withdrawn from the chamber 13 using the compressor 60, heat is transferred to the chamber. It is not always necessary or desirable to heat the cleaning vessel of the presently claimed invention every time the compressor is utilized. The system of Roberts provides no other option. Additionally, providing an integral compressor presents challenges in terms of construction and maintenance, particularly when compared to the claimed provision of a heat exchanging conduit.

Claim 21 of the present application recites the further step of using a trim heater to heat the second storage vessel and the contents thereof.

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Preston requires the use of a refrigeration circuit to chill the liquid carbon dioxide flowing from the two storage tanks. There does not appear to be any disclosure in Preston of the use of a heating element with respect to either storage tank, nor, based upon the need to extract heat from the liquid carbon dioxide, would that appear to be required.

CONCLUSION

In view of the foregoing amendments and remarks, Applicant respectfully requests that the Examiner reconsider the rejections and allow the claims. The Examiner is encouraged to telephone the undersigned attorney to discuss any matter that would expedite allowance of the present application.

Respectfully submitted,

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